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**Title:** IMPROVED CONNECTION DEVICE

**Technical Field**

The present invention relates to an independent means of inter-connecting a variety of audio signals such as radios, mobile phones (including satellite phones), intercom and personal stereos to a headset, particularly for use in an aircraft.

**Background Art**

The advent of reliable, cost-effective mobile telephones has had a significant impact on many occupations involving the simultaneous need for travel and communications, such as an aircraft pilot and/or passengers.

Although communication is possible with a pilot via radio, some small aircraft are not fitted with radios. Furthermore, communication with the pilot and/or passengers by non-air traffic control third parties can often require a considerable degree of effort - e.g. obtaining the correct frequencies, ensuring the aircraft radio is on, possessing the necessary radio transmission/reception equipment and license, (which is not fitted in many aircraft anyway, partly due to the strict licensing requirements), obtaining/maintaining a suitable signal strength and so forth, whilst providing no security from signal interception.

The use of a mobile phone on board an aircraft obviates many of the aforesaid problems. However, flying a plane whilst holding a phone can naturally cause difficulties and is impractical in an emergency. A "hands-free" phone does not solve the problem for a pilot wearing a headset.

Attempts to overcome this difficulty have thus far utilized the plane's intercom system to link the mobile phone to the pilot's headset. Not all fixed-wing aircraft in New Zealand are fitted with an intercom however (approximately 50%) and in the event of a power failure, use of the phone would be impossible with such a system.

Pilots operating in conjunction with other hand-held RT users such as the DOC, SAR, Police, Paramedics, Coastguard and so forth, typically operate on their own radio network. This makes communication between these users and the pilot (who has to

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simultaneously maintain a link to the aircraft radio and/or mobile phone inputs) quite problematic.

### Disclosure of Invention

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It is thus an object of the present invention to provide a device to substantially ameliorate the aforesaid difficulties.

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The present invention provides a device adapted for use in an aircraft for inter-connecting electronic audio signals from one or more predetermined signal input and/or output source(s) to at least one headset, said headset comprising a headset microphone and at least one headset earpiece, wherein all said predetermined input source signals are passively combined by said device to provide a single combined output to said headset earpiece, and a further signal from said headset microphone may be selectively connected to at least one of said predetermined signal sources; at least one of said predetermined signal sources being an analogue, digital, cellular or satellite mobile phone

Preferably, said sources further include an input/output for an aircraft radio/intercom.

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Preferably, said sources includes an auxiliary input/output suitable for connection to a personal stereo, video camera (for the audio sound track) or a two-way hand-held RT source such as the Police, SAR, Paramedics, DOC, Coastguard and so forth.

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Preferably, said device includes a mute feature, in which the output to the mobile phone may be optionally isolated from the output to the said remaining sources, including the radio/intercom.

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Preferably, said mute feature optionally reduces the volume of the combined output signal from all the input sources (except the said mobile phone) by a predetermined amount for the duration of use of the said mobile phone.

Preferably said predetermined amount is approximately 50%.

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Preferably a further volume-adjustable output signal taken from the headset microphone input signal is provided for use with a audio/audiovisual recording device such as video camera or similar.



Preferably, the said device is capable of being powered by a battery supply, independent of the aircraft power supply.

Preferably, the device may be switched between three states; - "OFF", "MUTE" and "ON" respectively, wherein in the "OFF" position, the device is electrically disconnected, leaving the headset connected to said radio/intercom (if provided); in the MUTE position, the device provides said mute facility; and in the "ON" position, all the source inputs are fed at an equal volume to the said headset earpiece(s).

As used herein, the term 'connected' or 'connectable' is defined as electrically connecting two or more devices or elements to provide a communication link for the passage of electrical signals/data.

#### **Brief Description of Drawings**

By way of example only, a preferred embodiment is described in detail with reference to the accompanying drawings in which

Fig. 1 - Shows a schematic representation of the operation of a preferred embodiment of the present invention.

Fig. 2 - Shows a symbolic representation of the electronic circuit of the embodiment shown in Fig. 2.

#### **Best Mode for Carrying out the Invention**

A preferred embodiment of the present invention is shown schematically in Figs. 1-2, consisting of a device (1) for interconnecting a plurality of input/output sources to an aircraft headset (2) which is composed of a headset microphone (3) and headset earpieces (4).

The input signals may be provided from a variety of source types, though it is envisaged that one such source would always be a mobile phone (5). Further optional signal sources may be an aircraft radio (6) and/or intercom (not shown) and other hand-held two-way RT radios (7) as used for example, by the Police, SAR, Paramedics, DOC, Coastguard and so forth.

All the aforesaid sources are provided with input and output connections to the device (1) to permit two-way communication. Further one-way optional auxiliary connections are provided for a personal stereo/CD-player type music source (8) and an audio output (9) (for recording commentary on video cameras, for example).

- 5 The mobile phone input (10), the radio/intercom input (11), the auxiliary RT input (12) and the CD-player input (13) are all (when present) passively mixed by device (1) to form a combined signal which is fed via output (14) to the headset earpiece (4).

The user's incoming to speech input (15) from the headset microphone (3) will be fed to all the connected outputs by default, i.e., the mobile phone output (16) (during a  
10 call), the output to the radio/intercom (17) (which is normally triggered/activated by speech), the RT source output (18) and to the auxiliary output (19)).

An optional mute facility is provided to isolate the headset microphone input (15) from all the outputs except the mobile phone output (10) whilst a call is in progress. This prevents the user's phone conversation being heard by any other intercom users, the  
15 control tower, and so forth. During a phone conversation, all the other inputs may still be heard by the pilot, while the volume of all said non-phone input signals may optionally be reduced for the duration of the call by a predetermined amount (a 50% reduction has been found satisfactory in practice). This enables the pilot to be aware of any important communications via the aircraft radio, whilst maintaining privacy for  
20 the phone conversation.

The device is powered by a rechargeable battery supply, with the facility to be powered directly from a suitable DC supply for recharging or for static non-flying applications. The independence of the device from the aircraft's electrical power supply enables the user to be seated anywhere in and even out of the aircraft  
25 (though some of the non-phone sources may naturally have to be disconnected).

It should be noted that although the headset (2) user can hear all the input source signals, none of the said sources are directly connected to each other.

The device (1) operates by means of the electronic circuit, one embodiment of which is shown symbolically in Fig. 2. The auxiliary RT (7) input/output (12, 18) is not

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included in this embodiment.

All the inputs (11,18) are fed via resistors  $R_B$  to provide the correct input load except the auxiliary input (13) which is first fed through two parallel resistors  $R_A$  providing isolation for the two (left and right) audio channels. The radio/intercom input (11) is also connected (via resistors  $R_D$  and  $R_E$ ) to the pole  $B_1$  of switch  $SW_1$  for the said muting facility. The input (10) to the device (1) from the mobile phone (5) is fed through a variable gain pre-amplifier  $A_1$ , which allows for the differing signal levels between mobile phone types. All the inputs (phone, radio and auxiliary) are then fed to an RC network ( $RC_1$ ,  $RC_2$ ,  $RC_3$ ) which passively combines the signals to give a single combined output. This output is fed through a buffer  $A_4$  to a master volume control  $V_{R2}$  which feeds an amplifier  $A_5$  to drive the headset speakers (4) via output (14).

The auxiliary output (9) is provided with a signal taken from the feed to the volume control ( $V_{R2}$ ) (which is fed to a buffer  $A_3$  and pre-set resistor  $V_{R1}$ ) to feed a combined signal of all the input source signals (including the headset microphone (3)) to output (19).

The headset microphone (3) is powered by the device (1) and is fed via the input (15) to the device to a pre-set resistor  $V_{R3}$ . A tap is taken from  $V_{R3}$  to the mobile phone outlet (10) to provide outgoing speech. The microphone (3) signal is also fed through a buffer  $A_2$  and a transformer  $T_1$  to provide outgoing speech to the radio/intercom (6). The transformer  $T_1$  provides DC isolation for the microphone (3) and is switched on/off by connecting/disconnecting to pole  $B_2$  of the switch  $SW_1$ . The MUTE switch  $SW_1$  is a single pole, double throw, center off switch, i.e., it connects an earth return to  $B_1$ ,  $B_2$  or the center 'off' position. When  $SW_1$  is connected to  $B_2$ , outgoing speech is possible to the radio/intercom output (17). When the  $SW_1$  is in the OFF position, the headset microphone (3) is isolated from the radio/intercom output (17), thus providing privacy for the user whilst making a phone call. When  $SW_1$  is connected to  $B_1$ , the headset microphone (3) is also isolated from the radio/intercom output (17) (as above), though the radio/intercom input (11) volume is reduced to prevent overriding the phone call.

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Disconnecting the power supply (not shown) to the device (1) electrically disconnects all the input/outputs from the headset (2), except the radio/intercom (6). Thus, in the event of insufficient battery power, or even if the user becomes confused, distracted, or irritated by other source inputs, simply switching the device off leaves the user still  
5 connected to air-traffic control instructions via the aircraft radio (6).

Claims

1. A device adapted for use in an aircraft for inter-connecting electronic audio signals from one or more predetermined signal input and/or output source(s) to at least one headset, said headset comprising a headset microphone and at least one headset earpiece, wherein all said predetermined input source signals are passively combined by said device to provide a single combined output to said headset earpiece, and, a further signal from said headset microphone may be selectively connected to at least one of said predetermined signal sources; at least one of said predetermined signal sources being an analogue, digital, cellular or satellite mobile phone

2. The device as claimed in claim 1, wherein said sources further include an input/output for an aircraft radio/intercom.

3. The device as claimed in claim 1 or claimed 2, wherein said sources includes an auxiliary input/output.

4. The device as claimed in any one of the preceding claims, further including a mute feature, in which the output to the mobile phone may be optionally isolated from the output to the said remaining sources, including the radio/intercom.

5. The device as claimed in claim 4, wherein said mute feature optionally reduces the volume of the combined output signal from all the input sources except the said mobile phone by a predetermined amount for the duration of use of the said mobile phone.

6. The device as claimed in claim 4 or claim 5, wherein the device may be switched between three states; - "OFF", "MUTE" and "ON" respectively, wherein in the "OFF" position, the device is electrically disconnected, leaving the headset connected to said radio/intercom (if provided); in the MUTE position, the device provides said mute facility; and in the "ON" position, all the source inputs are fed at an equal volume to the said headset earpieces).

7. The device as claimed in any one of the preceding claims, wherein a further volume-adjustable output signal taken from the headset microphone input signal





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is provided for use with an audio/audiovisual recording device.

8. The device as claimed in any one of the preceding claims, wherein, the said device is capable of being powered by a battery supply, independent of the aircraft power supply.
- 5 9. The device substantially as hereinbefore described, with reference to and as shown in the accompanying drawings.

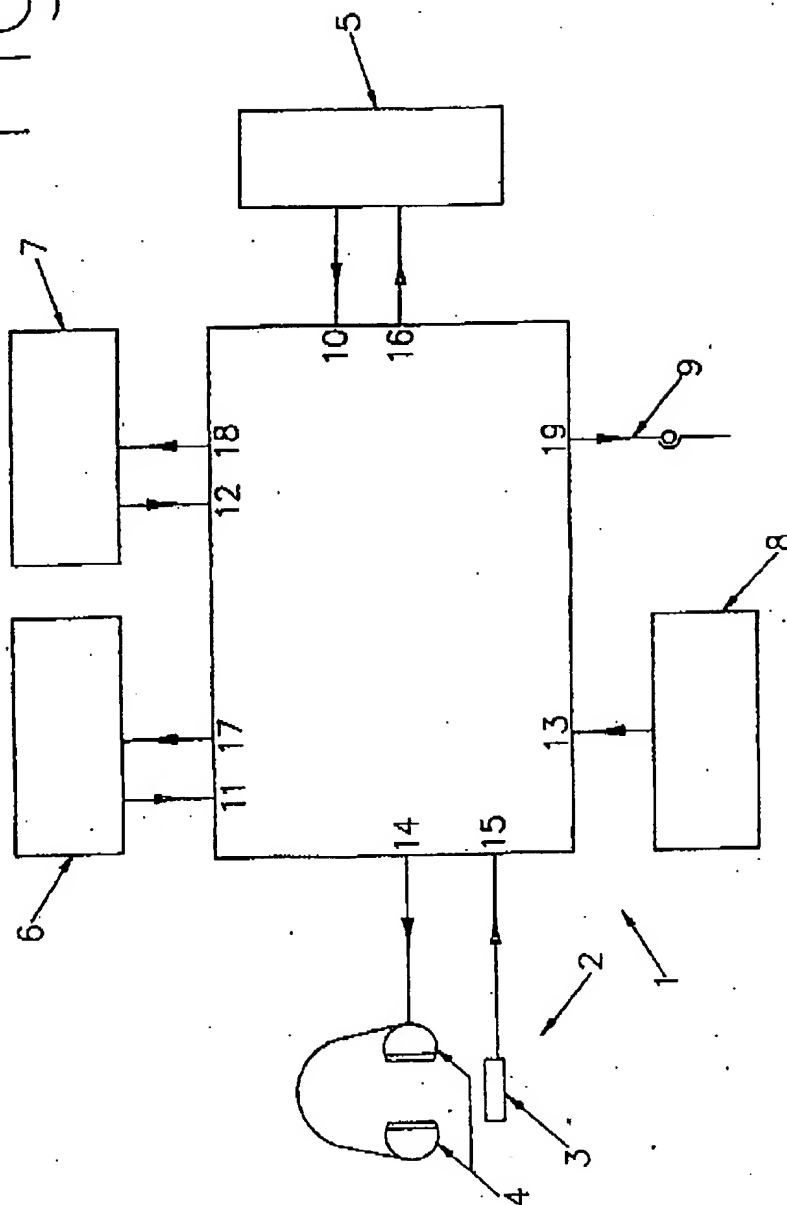
**Abstract**

A device (1) providing an independent means of inter-connecting a variety of audio signals such as mobile phones (5) (including satellite phones), radios (6), intercom and personal stereos to a headset (2), particularly for use in an aircraft.

- 5 All input source signals (10-15) are passively combined by said device (1) to provide a single combined output to said headset earpiece (4), whilst an input signal from said headset microphone (3) may be selectively connected to at least one of said signal sources; at least one of said signal sources being an analogue, digital, cellular or satellite mobile phone (5).

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Fig. 1



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Fig. 2.

